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REVIEW OF ACTIVITIES FOR THE PROMOTION AND STRENGTHENING OF RELATIONSHIPS WITH OTHER RELEVANT CONVENTIONS AND RELEVANT INTERNATIONAL ORGANIZATIONS, INSTITUTIONS AND AGENCIES

Collaboration and synergies among Rio conventions for the implementation of the UNCCD

Note by the secretariat

1. This document reports on progress related to the implementation of decision 8/COP.2, as so requested in that decision. It also suggests ways of enhancing cooperation among the conventions signed at the United Nations Conference on Environment and Development (UNCED) or as a result of it, as well as other conventions related to sustainable development and relevant to the global effort to combat desertification. In doing so, this document elaborates on the report submitted to the Conference of the Parties (COP) at its second session (ICCD/COP(2)/7) and develops at the programmatic level, specific aspects of possible fields of cooperation already identified in that report. In this context, it essentially targets potential areas for joint implementation.

2. Decision 8/COP.2 also requested the secretariat of the United Nations Convention to Combat Desertification (UNCCD) to develop as appropriate with relevant secretariats "... a memorandum of understanding to define their collaboration and cooperation". In this regard, the secretariat has signed memoranda of understanding (MOUs) with the secretariats of the Convention on Wetlands (the Ramsar Convention) and the Convention on Biological Diversity (CBD). These MOUs are available at the UNCCD secretariat and can be provided upon request. The secretariat has also engaged in consultations with the United Nations Framework Convention on Climate Change (UNFCCC) with a view to developing a memorandum of understanding that would identify priority areas of cooperation. These consultations have included considerations pertaining to the scope and nature of the MOU so as to determine its final structure (i.e. national level activities, data and information management,

training issues, national communications). The secretariat has also developed MOUs with other institutional partners. It has signed an MOU with the Food and Agriculture Organization of the United Nations (FAO) and will sign one with the United Nations Educational, Scientific and Cultural Organization (UNESCO), which successfully finalized its internal procedure for the adoption of the proposed text, during the third session of the COP. The secretariat has also defined and adopted with the United Nations Development Programme (UNDP) a "cooperation framework" for the implementation of the Convention. In the same context, the secretariat is engaged in consultations with the United Nations Environment Programme (UNEP), the International Fund for Agricultural Development (IFAD) and the Global Environment Facility (GEF) secretariats for the finalization of additional MOUs.

3. The executive summary and the introduction to this document explain the need for coordination of the different implementation processes and describe briefly the rationale to explore further existing synergies in field implementation between the UNCCD and other conventions, in particular CBD, UNFCCC and the Ramsar Convention. Chapter II "The ecological linkages", addresses the scientific and technical linkages between desertification, biodiversity, climate change, forests and wetlands. Chapter III "Synergies in field implementation", reviews the benefits arising from the UNCCD for the other sustainable development conventions, presents the different types of dryland and suggests a strategy for combating desertification in linkage with the implementing of other conventions in each of them, and proposes a two-phased action plan for synergies in field implementation of the UNCCD. Chapter IV "Partners for synergies", reviews further steps at the level of the institutions, that could be taken to enhance the effective and synergetic field of implementation of the UNCCD as well as of each other convention.

4. This note was prepared by the UNCCD secretariat in consultation with the secretariats of the UNFCCC, CBD and the Ramsar Convention as a follow-up to document ICCD/COP(2)/7. The views of UNDP and GEF were also sought in the elaboration of this document.

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Executive summary

5. At the time the third "Rio convention", the United Nations Convention to Combat Desertification (UNCCD), entered into force, concern about overlaps and awareness of potential synergies in the implementation of the three Rio conventions (Convention on Biodiversity (CBD), United Nations Framework Convention on Climate Change (UNFCCC), and UNCCD) as well as other related environmental conventions (e.g. Ramsar Convention) and agreements (e.g. the Forest Principles) has been developing (UNDP 1998). The Conference of Parties to the UNCCD, at its second session, asked the secretariat of the UNCCD to propose to the third session "further steps that could be taken to enhance cooperation among convention secretariats while advancing the effective implementation of each Convention" (ICCD/COP(2)/7). This paper elaborates on the ecological linkages among the subject matters of the Rio conventions and proposes a mode of synergizing the implementation of the UNCCD by activities that conserve and promote sustainable use of biodiversity, forests and wetlands, and mitigate climate change, by combating desertification.

6. The rationale is that win-win measures, that combat desertification and also sequester carbon and/or conserve and promote sustainable use of biodiversity, may synergize combating desertification, by their potential to attract support for local populations in their combat against desertification. The paper does not address coordination at the level of the secretariats and institutions as a prerequisite for synergistic implementation. It focuses on how first to achieve synergies at the field level by reconciling an initial "top-down" field testing of the synergistic approach with a subsequent promotion of a "bottom-up" ownership of the process, such that the first phase of synergistic implementation is a precondition for a second upscaling phase aiming at large-scale implementation.

7. Desertification is linked to biodiversity through vegetation: the loss of vegetation brings about desertification, and desertification prevents its regeneration. Desertified ecosystems are those in which biodiversity is damaged to the extent that it can no longer sustain human livelihoods based on free ranging livestock. Vegetation diversity protects dryland topsoil from erosion. Where range uses damage vegetation, this initiates and accelerates topsoil erosion. The widely practised dryland transformation from rangeland to cropland may cause irreversible irrigation-induced salinization, such that dryland biodiversity, that constitutes several economically and culturally significant assets and is instrumental in the provision of ecosystem services, may be difficult to restore. Therefore, conserving biodiversity prevents desertification and the combat against desertification conserves biodiversity for a sustainable use. Live and dead plant material, above- and especially below-ground, sequesters carbon ("sink") and functions as a stored carbon pool ("reservoir"). Desertification caused and expressed by loss of vegetation, deforestation and loss of topsoil and the resulting loss of soil organic carbon, exacerbates climate change. Reduction in the *global* carbon reservoirs and sinks is both a cause and an effect of *regional* and *local* desertification. Forests are instrumental in forestalling desertification, both directly through their effect

on soil and water, and indirectly through their role in mitigating climate change and supporting biodiversity.

8. Dryland deforestation contributes to desertification, and reforestation of desertified land is a means to combat desertification. Wetlands are not common in drylands, therefore the significance of the existing few there, is great. This relates to water storage capacity, to protecting very rich and highly productive biodiversity and promoting its economic use including fisheries, and to providing for recreation activities and ecotourism. Water resource development of drylands often involves impounding water sources that nourish and sustain the wetlands. Another cause of loss of dryland wetlands is deliberate drainage for transformation to agricultural land. The resulting uncontrolled floods reduce water availability and increase soil erosion, on top of denying local populations the plethora of economic benefits provided by the wetland.

9. Combating desertification can be effected in ways that achieve also the objectives of the CBD, UNFCCC, Ramsar Convention, and the Forest Principles and yet provide an immediate tangible benefit to local populations. The proposed strategies for combating desertification do not attempt to make drylands function as non-dryland ecosystems, a recipe for desertifying the drylands and perpetuating the poverty of their inhabitants. Rather, dryland attributes that can be harnessed to provide dryland inhabitants with an economic competitive advantage, compared to inhabitants of non-dryland regions, are identified. The dryland curses of intense solar radiation, high temperatures, low-quality water, and desolation and wilderness can be turned into the blessings of solar energy, winter cash-crops, aquaculture and ecotourism, respectively. All these can be produced in drylands at lower economic and environmental costs than in the non-drylands.

10. A prescribed option to combat desertification should be matched with the ecological as well as the socio-political environment for which that option is most likely to result in sustainability. Many such options constitute alternative livelihoods that release much of the pressure from the dryland soil and water resources. Therefore, by default, they also contribute to the conservation of biodiversity and to the mitigation of climate change. Dryland people can take advantage of the global concern for climate change and biodiversity. They may implement practices that not only combat desertification, but also mitigate climate change and conserve biodiversity. They should publicize their activities and successes so as to encourage other beneficiaries to reward them for their contributions ranging beyond the local desertification.

11. Though confined to countries with drylands, desertification has indirect but strong transboundary effects. Yet, since desertification *of the drylands* is expected to be exacerbated by *global* climate change it is beneficial for dryland people to take action in reducing the threat to their land from climate change. By the same token, *local* desertification may contribute to *global* climate change and may harm biodiversity of both *local* and *global* significance. Hence it is in the interest of non-dryland countries to assist affected countries in their combat

against local desertification. The cost of combating desertification by attending to the concerns of the CBD and the UNFCCC may be low compared to the global benefits of this synergy.

12. When an affected country links measures to combat desertification with measures to sequester carbon and conserve biodiversity, it reaps benefits for itself, benefits that should justify the invested costs. However, since these linkages can also benefit other countries, through averting the detrimental cross-boundary direct and indirect effects; and since often for achieving this, incremental costs have been invested, these can be charged to the benefiting countries, thus synergizing UNCCD implementation, pursuant to the new desertification-related policies of the Global Environment Facility.

13. A framework for an action plan for synergies is proposed, based on four principles: (a) a two-phase plan - first phase of designing and implementing integrated pilot and demonstration projects, then repeating the success of the first phase on a whole-country scale; (b) a sequential multi-stage development of the plan, in which benefits of win-win actions and additional actions related to the other conventions are decomposed to local, national and global "portions"; (c) attaching an "incremental cost" to the programme elements of combating desertification that are beneficial to the global environment; (d) awareness-raising by a cadre of local facilitators, rallying support for combating desertification, thus providing the synergy in UNCCD field implementation.

14. The second phase of the action plan for synergies becomes operational some time after the success of the first one has become evident. In the first phase, a few or even a single local area demonstration programme could be designed for an affected country Party. Though a participatory approach will be sought, such a programme would require top-down stimuli. For example, a programme will be based on an integrated watershed management approach, in which different activities will be allocated to different sections of the watershed.

15. As an example of the first phase, the first stage of planning is just for combating desertification. In the second stage of planning, each of the prescribed anti-desertification activities is explored to detect benefits to biodiversity, mitigating climate change, etc. The third stage evaluates the degree to which these activities benefit just the community or country, or also have a global effect. In the fourth stage, additional activities for conserving biodiversity or mitigating climate change *per se* are planned, either on top of or replacing some of the anti-desertification measures. In the fifth stage, the additional measures are evaluated for their national vs. global benefits. The five stages are repeated iteratively until the optimal plan of action is selected, one which optimizes the combat against desertification while achieving the goals of the other instruments, and maximizes the benefits to the local population. After costing project components and the total incremental costs, the programme is presented to the Global Mechanism for assistance in generating support, and synergizing the joint and integrated field implementation.

16. Even if successful, the first phase does not suffice to benefit the affected country as a whole. To achieve this, a lengthy second phase of "upscaling" and replicating tested approaches would be carried out, by multiplying local area development programmes under the respective national action programmes (NAPs), or even integrating some programmes with other initiatives, such as for example the biosphere reserve concept. This broader phase is sustained by generating a bottom-up approach. Local communities throughout the country are sensitized by trained local facilitators, which creates the enabling conditions for repeating the success of the pilot programmes. In the longer term, the aim would be to cover all priority areas with higher synergistic potentials, if not on a whole-country scale. Thus, underlying the action plan is an awareness not only of desertification but also of the synergies, not only of local populations but also of governments and other beneficiaries.

17. The awareness raised within local populations should spread with the help of the facilitators to levels of community leaders, policy makers, and local, regional and global organizations. This may enable synergy projects and practices to become widespread. A key step in this evolution consists in the possibility of identifying "synergy incentives" for the affected populations of the drylands. The GEF can play a major role in this respect, as well as the United Nations and other regional and international organizations. The COP may wish to request the UNCCD secretariat to design, together with other concerned institutions, plan, propose and promote the tools and mechanisms for creating this cadre of local facilitators and enable its operation.

18. A major challenge for the COP and the secretariat is to bring together the tools, mechanisms and institutions that will design and deliver the necessary capacity-building tools for synergistic programming. A priority of institutions related to the UNCCD process should be to mould this human resource, so critical for the success of the widespread synergistic combat against desertification. Country Parties and the institutions of the UNCCD may look for partners who could benefit too from the combat against desertification, and are already developing concepts that may be instrumental in the synergistic approach to field implementation. Concerted effort will be required to harmonize and integrate the work of these partners, so that the synergy in their work will facilitate the synergy in field implementation, through the proposed framework of the action plan for synergies.

I. INTRODUCTION

A. Background

19. Article 8 of the UNCCD calls for coordination of activities carried out under the UNCCD, with activities carried out under other relevant conventions, especially the "Rio conventions" (UNFCCC and CBD), in order to *"derive maximum benefit ... while avoiding duplication of effort"*. This coordination may be in the form of *"joint programmes ... in ... research, training, systematic observation and information collection and exchange"*. Articles 4.8(c) and 4.8(e) of the UNFCCC and article 20.7 of the CBD provide for particular consideration of countries with arid and semi-arid areas and experiencing desertification and drought.

20. The need to explore synergies derived by integrating measures called for by the Rio conventions was raised in April 1995 at the meeting of the Commission on Sustainable Development (CSD) in New York. As a result, an Expert Meeting on Synergies among the Conventions on Climate Change, Biological Diversity and Desertification and the Forest Principles was convened in the Blaustein Institute for Desert Research at Sede Boqer, Israel in March 1997. The summary of this meeting was published by the Division for Sustainable Energy and Environment of the United Nations Development Programme (SEED-UNDP) as a booklet entitled "Synergies in National Implementation" in January 1998.

21. The Conference of the Parties to the UNCCD, at its first session, requested (decision 13/COP.1) the head of the Interim Secretariat to strengthen the collaboration with other relevant conventions (Rio conventions, as well as the Ramsar Convention on Wetlands), in order to advance effective implementation. The secretariat reported to the Conference of the Parties at its second session on its implementation of the above decision, in a document "Promotion and strengthening of relationships with other relevant conventions, collaboration and synergies among Rio conventions for the implementation of the UNCCD" (ICCD/COP(2)/7). The last chapter of this document *"proposes further steps that could be taken to enhance cooperation among convention secretariats while advancing the effective implementation of each convention"*.

22. Having discussed document ICCD/COP(2)/7, the Conference of the Parties requested the secretariat (decision 8/COP.2, "Collaboration with other conventions") to implement the recommendations of the above document, and to report on these activities to the Conference of the Parties at its third session. This paper elaborates on document ICCD/COP(2)/7, especially with regard to its recommendation in section IV.34, *"... to encourage the formulation of specific actions at the national level to further develop synergy processes that would contribute to a more effective implementation of the Rio conventions ... possible action may be taken at the national level among focal points of the various conventions with a view to enhancing synergy..."*, and in IV.37, to assist national focal points *"... to educate and increase awareness ... to introduce biodiversity, climate change and desertification awareness in national policy-making processes..."* and to *"... help*

in addressing public awareness ... of resources available at the international level".

B. Rationale and objective

23. Avoiding duplication of effort and ensuring that the implementation of the conventions is efficient and cost-effective motivated articles in the text of the UNCCD and decisions of the General Assembly, the CSD and the COPs of the conventions. The Sede Boqer workshop listed overlapping requirements of the Parties to the agreements (table 1). Most of these address institutional modalities rather than implementation in the field. The recommendations of the workshop are published in the booklet "Synergies in National Implementation".

Table 1. Overlapping requirements of the Parties to the Rio agreements, exemplified by selected articles

	Desertification	Climate change	Biological diversity	Forest Principles
National inventories		Article 4.1. (a)		Principle 12(a)
National and regional action plans	Articles 9, 10	Article 4.1. (b)	"Strategies" Article 6(a),(b)	Principles 3(a), 5(a), 6(b), 8(d) & (h), 9(c), article 4(b) and IPF proposals for action
Identification and monitoring	Article 16		Article 7	
Develop protected areas			Article 8	Principles 7(b), 8(f)
Legislation	Article 5(e),	Preamble	Article 8(k)	Principles 8(f), 13(d) & (e)
Research	Articles 17, 19(b)	Article 5	Article 12(b)	Principle 12(a)
Public education	Articles 5(d), 19, 6	Article 6	Article 13	Principle 12(d)
Environmental impact assessment			Article 14	Principle 8(h)
Clearing house for technical information	Article 18		Article 18	
Public participation	Article 19(4)	Article 6 (a) (iii)	Article 9	Principle 2(d)
Exchange information	Article 16	Article 7.2. (b)	Article 17	Principles 2(c), 11, 12(c)
Training	Article 19	Articles 6, 7, 12	Article 12(a)	Principles 3(a), 11, 12(b)
Reports		Article 12	Article 26	
Data collection	Article 16		Article 7	Principle 12(a)
Examine obligations-Assess implementation		Article 12	Article 23	Principle 12(a)
Report steps to COP	Article 26	Articles 7.2.(e), 12	Article 26	

Source: "Synergies in National Implementation"; the Ramsar Convention articles 2 and 4 address national inventories and training, respectively (Kingsford, 1997).

24. For example, to tackle the lack of coordination between national focal points for the conventions due to each being placed in a different ministry (usually the UNCCD in the ministry of agriculture, the CBD in a ministry responsible for nature conservation, the UNFCCC in the ministry of environment and the Ramsar Convention in the ministry responsible for water management), it is proposed to create a new "critical focus" within governments, bringing together institutions with diverse interests to work toward goals common to all instruments. To reduce information and reporting requirements, modalities for constructing integrated information systems and reporting mechanisms are proposed. Finally, a number of options for developing a national action plan to implement the Rio instruments while harmonizing it with other national plans are discussed.

25. The workshop booklet uses the Concise Oxford Dictionary definition of synergy: *"a combined effect ... that exceeds the sum of individual effects"*. This definition is adopted in this paper too. The objective is to synergize field implementation of the UNCCD by attending also to subject-matters of the other agreements. An example of such a synergy is implementing a measure to combat desertification, such that it will be more effective in combating desertification if carbon sequestration is also sought, either by the same measure to combat desertification, or by an added measure. Thus, a win-win measure, that combats desertification and also sequesters carbon, synergizes combating desertification, by its potential to attract support for local populations in their combat against desertification.

26. It should be noted, though, that while effective coordination and synergy can reduce administrative and operational costs, coordination and synergy impose costs. Therefore, coordination and synergy for their own sake are unlikely to result in benefits unless directed towards specific goals. This paper does not elaborate on synergy in the work of the secretariats and institutions of the Rio and other agreements. Setting field implementation as the goal, the paper explores options for implementation of potential synergy, at the field and community levels. It then proposes a strategy for combating desertification, in ways that address core areas of other conventions. The strategy has a two-way approach. On the one hand, the UNCCD is implemented at the field level in such a way that it may complement or even synergize the implementation of *other* conventions. On the other hand, this in turn facilitates the mobilization of support for the implementation of the UNCCD. In this way, combating desertification is synergized by addressing the subject-matters of other conventions.

27. The paper does not deal with coordination at the level of the secretariats and institutions as a prerequisite for synergistic implementation. Rather, it focuses on how first to achieve synergies at the field level. To do this, it proposes reconciling an initial "top-down" field testing of the synergistic approach with a subsequent promotion of a "bottom-up" ownership of the process. Thus, the first phase of synergistic implementation is a precondition for a second upscaling phase aimedg at large-scale implementation.

28. The paper is directed at the country Parties to the UNCCD and aims at creating an impetus for considering their benefits of synergy. Thus, the goal is to generate a country-driven process, by which national discussions and resulting national positions on synergies will lead to discussion in the COP on modalities, which in turn will result in further requests from the UNCCD secretariat.

29. The paper elucidates first the ecological linkages between the conventions' subject-matters. It then discusses the synergies in field implementation across the different dryland categories. It then outlines a framework of an action plan for synergies to be implemented in the field and at the community level. Finally, potential partner institutions to the implementation of such a plan are identified.

II. THE ECOLOGICAL LINKAGES

30. In this section the negative interactions between the subject-matters of the conventions are described. It is the integrated combat against the causes of these interactions and their effects that generates the synergy in combating desertification.

A. Desertification and biodiversity

31. *"**Desertification** means land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including ... human activities; **land degradation** means reduction or loss ... of ... productivity ... of ... cropland, or range, pasture, forest and woodlands resulting ... from ... [a] combination of processes ... arising from human activities"* (UNCCD, article 1). Traditionally, drylands are used as range. Another use is cropping, whereby rangeland is transformed into cropland. Land degradation of these drylands, namely desertification, is mainly expressed in soil erosion in rangelands and croplands, and salinization of croplands.

(a) Rangeland degradation and vegetation

32. The fertility of dryland soils is relatively low and concentrated in the thin topsoil. When topsoil erodes, the exposed underlying soil is devoid of organic matter (contributing to water-holding capacity of the soil), nutrients (essential for plant growth) and seeds (for rehabilitating the vegetation). Vegetation cover protects the topsoil from water erosion in the rainy season and from wind erosion in the dry season. Vegetation cover is lost due to overgrazing and overexploitation for firewood or for herbal and medicinal uses. Once erosion starts, it is difficult to restore the natural vegetation even if the causes of erosion have been removed, because the topsoil is already lost. This irreversibility epitomizes desertification. Furthermore, reduction of the vegetation cover (a) increases albedo (the reflectance properties of the soil surface), which can reduce local precipitation; (b) changes surface roughness, which influences wind speeds and turbulence involved in evapotranspiration; and (c) increases warming due to reduced evapotranspiration. To conclude, vegetation is the key factor in desertification:

loss of vegetation brings about desertification, and desertification prevents regeneration of the vegetation.

(b) Cropland degradation and vegetation

33. The transformation of rangeland to cropland entails the replacement of the natural range vegetation by cultivated domestic vegetation. This often results in soil erosion since the crop plant cover is less effective than that of the range vegetation in protecting the soil. Another cause of cropland degradation is soil salinization, which results from heavy dependence of dryland cropping on irrigation. Due to the high evaporation rates in drylands and since water scarcity does not allow using large quantities of water for leaching, dryland irrigation brings about soil salinization. Also, irrigation may leach soil salts to groundwater, which is then reused for irrigation. Eventually soil salinity reaches a threshold value at which the cropland can no longer be productive, and is abandoned. The cropland can not usually revert to rangeland, since the indigenous rangeland vegetation may not tolerate such high salinity. Hence, the transformation from rangeland to cropland may be irreversible, and the natural vegetation may not be easily restored.

(c) Biological diversity and vegetation

34. *"**Biological diversity** means the variability among **living organisms** from all sources ... and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems"* (CBD, article 2).

35. In terrestrial ecosystems the diversity among plant species (vegetation diversity), is a component of biodiversity (shorthand for "biological diversity"). In rangeland ecosystems the critical "living organisms" are the pasture plant species. The variability among these plant species is essential for the sustainability of livestock farming in three ways. First, a grazing animal requires a balanced diet provided by an appropriate mixture of pasture species that can maintain the herd throughout the year. Secondly, especially in the drylands, livestock herds comprise several species (sheep, goats, camels, cows, donkeys and horses) with different dietary preferences, all foraging in the same range. Therefore, the greater the diversity of forage species, the higher the profitability of the dryland livestock economy. Finally, the within-species variability of range species is often critical; a single range species may have several varieties, each with different properties and diverse benefits. Thus, dryland rangelands, vegetation and livestock, are the *"ecological complexes"* of which *"the variability among living organisms of all sources"* is part. The diversity of the organisms and their rangeland ecosystems are the *biodiversity*. Desertified ecosystems are those with biodiversity damaged to the extent that it can no longer sustain livelihoods based on free-ranging livestock.

36. Vegetation diversity is also critical for protecting dryland topsoil. The complex architecture of both the above-ground vegetation and the below-ground root systems determines the impact of raindrops and of wind gusts on the soil surface.

A reduced impact lessens the potential for soil erosion. All dryland plant species depend on soil for water and nutrients and most of them contribute to the joint protection of the topsoil from erosion. Therefore, damage to rangeland biodiversity initiates and accelerates topsoil erosion, which ultimately results in desertification.

(d) Desertification threats to biodiversity assets

37. Once desertification is under way, it threatens not only dryland agriculture and pastoralism but also dryland biodiversity, which, besides protecting soil from erosion, has valuable assets. For example, many cultivated food crops originated in drylands. The wild progenitors and their wild relatives are adaptable and resistant to disease, drought, salinity and other stresses and hence are a valuable source for crop improvement. Other dryland species are used as food by humans, and are of significance in years of drought. Yet other species may be cultivated as crops in the future. Also, dryland species are important source of commercial and industrial products, gums, resins, plant-based waxes, oils, biocides and pharmaceuticals. All these assets are significant due to their genetic richness. But drylands have also high species richness in some regions. Also, many dryland species have a restricted geographical range (endemism) and thus constitute scientific and cultural assets. Some of these are "charismatic" wildlife (e.g. the Arabian oryx) of ecotourism significance. All these biodiversity assets are at risk when their habitats lose their productivity due to soil erosion and salinization.

38. On top of soil erosion and salinization, biodiversity is also threatened by the mere substitution of rangeland by cropland. Rangeland transformation requires removal of large tracts of indigenous vegetation to make room for cropping, thus reducing the geographic extent and the overall population sizes of the plant and animal species. This in turn threatens the species' long-term persistence; the greater its geographic extent is, the larger is its population size and the lower are the risks of local or regional extinction. Furthermore, the reduced extent of range increases the pressure of pastoralists on the remaining range. This may encourage overgrazing and thus bring about desertification to the remaining rangelands. To summarize, the transformation of dryland range to cropland is associated with risks to biodiversity linked with desertification risks. Loss of dryland biodiversity indirectly brings about desertification, and this desertification prevents the rehabilitation of biodiversity. Combating desertification therefore guarantees sustainable use of dryland biodiversity assets and provision of their services.

B. Climate change, desertification and biodiversity

39. ***Climate change*** means *"a change of climate which is attributed ... to human activity that alters the composition of the global atmosphere . . ."* (UNFCCC, article 1). The change of the global atmosphere is due to human-induced release of "greenhouse gases", of which carbon dioxide is highly significant. Climate change can be mitigated by promoting ***sinks*** (*"... any process, activity or mechanism*

which removes a greenhouse gas ... from the atmosphere" - UNFCCC, article 1) and generating or maintaining ***"reservoirs"*** (*"... components of the climate system - the totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions - where a greenhouse gas … is stored"*, UNFCCC, article 1). Each of the Parties to the Climate Change Convention *"shall ... take ... measures on the mitigation of climate change, by ... protecting and enhancing its greenhouse gas sinks and reservoirs"* (UNFCCC, article 4.2(a)).

(a) Rangelands and carbon sink and reservoir

40. Vegetation acts as a carbon sink; plants convert the naturally occurring atmospheric greenhouse gas, carbon dioxide, into solid organic material -tissues that form the plants' trunks, shoots, roots, leaves, etc. This "sink" generates the "reservoir" - all live and dead organic material of which plants (above-ground and below-ground parts) constitute the largest mass. Damage to this reservoir releases the stored carbon to the atmosphere, and also impairs further sink functions. For example, when a tree is felled and burns or decomposes, its stored carbon converts to atmospheric carbon dioxide. The dead tree is thus a lost reservoir, and since it can not absorb atmospheric carbon dioxide and convert it to organic carbon, a sink activity is lost as well.

41. In desertification-prone ecosystems such as dryland range, the loss of vegetation cover and the difficulties in restoring it result in a reduction of the global carbon sink and reservoir. This is not because firewood and forage are oxidized to atmospheric carbon dicxide via burning and respiration, respectively, but because overgrazing and overexploitation irreversibly impair vegetation regrowth, hence its sink and reservoir functions. Thus, the processes leading to desertification, and especially the inadequate access of dryland people to energy resources other than firewood, contribute to global warming.

(b) Croplands and carbon reservoir and sink

42. When rangeland is transformed into cropland, the vegetation cover of the agricultural crop may be even greater than that of the range vegetation. But this does not necessarily mean that the carbon sink increases. Many crops are annual, and are harvested after a few months. Constrained by water availability, there is often a fallow period during which the bare soil is exposed to wind or water erosion that results in the loss of soil organic carbon. This leads to eventual abandonment and to losing the cropland's sink function. Intensification of dryland agriculture through resource-based rather than input-based farming systems, i.e., mining soil fertility without replacing it with fertilizers, causes nutrient depletion that reduces the dryland soil carbon pool.

43. The below-ground plant material in drylands may be a larger reservoir than the above-ground stored carbon. The below-ground reservoir includes inorganic and organic carbon, the latter being made up of live and dead roots and soil organic matter. The total carbon pool of global drylands comprises 33 per cent of the

global soil carbon pool. Desertification has already caused a substantial (38 to 58 Pg C/yr) loss of soil carbon emitted to the atmosphere. On the other hand, desertification control has the potential to sequester 0.9-1.9 Pg C/yr, which is 27-57 per cent of the annual increment in atmospheric carbon due to anthropogenic emissions, estimated at 3.3 Pg C/yr. This re-sequestration by soil and vegetation rehabilitation, can be carried out within the coming 25-50 years (Lal, 1999). At the same time this re-sequestration improves soil quality and productivity and increases water quality.

44. To conclude, conversion of rangeland to cropland, followed by agricultural practices leading to desertification, reduce the soil carbon pool and above-ground sink function, thus contributing to increased global atmospheric concentration of greenhouse gases. On the other hand, combating desertification by carbon sequestration is a win-win strategy that can buy time, during which non-carbon alternatives to fossil fuel can be developed.

(c) Climate change and dryland biodiversity

45. Reduction in carbon reservoirs and sinks is both a cause and an effect of desertification. Thus desertification contributes to global, regional and local climate changes. It is predicted that an increase in global temperature of one to two degrees Celsius by 2030 to 2050 will result in climate changes in regions affected by desertification (Watson et al, 1998). This is expected to exacerbate regional desertification. Global climate change is expected to exacerbate regional and local desertification and the causes and results of desertification reduce below-ground and above-ground vegetation, the same vegetation that is so instrumental as sink and reservoir. However, it is not known whether the sink function depends on the overall plant biomass irrespective of plant species composition, i.e., of biodiversity. Although some species may be interchangeable, the degree of redundancy is not known. It is therefore prudent to conserve the entire dryland biodiversity as a precautionary measure for maintaining sink and reservoir services of dryland vegetation.

C. Forests, climate change, biodiversity and desertification

46. **Forests** are *"ecological systems dominated by trees, buffering the earth against the full impact of the sun, wind and precipitation"* (Encyclopedia Britannica, 1975, Benton, London). *"All types of forests embody complex and unique ecological processes which are the basis for their present and potential capacity to provide resources to satisfy human needs as well as environmental values"* (The Forest Principles, 1992). Though forests and drylands are often perceived as incongruous entities, in many types of drylands, and especially in dry sub-humid areas, forests are widespread and play significant ecological and economical roles. Forests are instrumental in mitigating climate change and promoting biodiversity, globally and in drylands. Forests are instrumental in forestalling desertification, both directly through their effect on soil and water, and indirectly through their role in climate and biodiversity.

(a) Forests and desertification

47. Forest ecosystems perform hydrological, climate and soil stabilizing functions in drylands too. Deforestation reduces the water retention capacity of the soil, and increases soil erosion and run-off. Widespread deforestation may dry up local climates and increase evapotranspiration. Since water scarcity and loss of soil induce desertification, dryland deforestation contributes to desertification, and reforestation of desertified land is a means of combating desertification. Furthermore, afforestation (i.e. transforming an originally non-forest dryland ecosystem into a forest ecosystem) may be an option for combating desertification, provided that it is not carried out at the expense of local biodiversity.

(b) Forests and climate change

48. Forests comprise the largest carbon reservoir per unit of soil surface, and their sink function is very effective. The conversion of forests to rangeland or cropland functions as a carbon source to the atmosphere (IPCC 1996). Climate change itself accelerates forest destruction, through increased incidence of forest fires, especially in drylands. Dryland deforestation therefore accelerates climate change and dryland reforestation does not only combat desertification but also assists in mitigating climate change. Furthermore, afforestation - increasing the extent of dryland forests - while used as a means of preventing desertification, also increases the sink function and reservoir capacity of drylands.

(c) Forests and biodiversity

49. Besides having trees, forests are habitats for many non-tree plant and animal species. Deforestation is often not spatially contiguous and even if the area of the remaining forest is large, many species can be lost due to the fragmentation of their habitat. Dryland forests can be used sustainably for provision of forage and firewood. The quality of this provision depends greatly on the forest biodiversity. Forests are also instrumental in recharging dryland aquifers, and the quality of this ecosystem service of forests is a function of plants' architectural above-ground and below-ground diversity, which in turn depends on vegetation diversity. Deforestation therefore accelerates desertification via its effect on biodiversity.

(d) The multisectoral interactions

50. Past climate changes have been sufficiently slow to enable forest species to shift their ranges and forest ecosystems to restore their structure and function. The much faster-than-expected global warming will impair the restoration of ecosystem structure and function. The dryland forest species will vary in their spatial distribution and population sizes, such that some may become endangered or even extinct, and others may form new communities in ecosystems of altered quality of their services. For example, the new dryland forest ecosystems may generate new values of albedo, increased surface temperature and lower soil moisture,

detrimentally affecting soil microbial diversity and its role in decomposition and nutrient cycling. Thus on the one hand, forests mitigate the detrimental effects of climate change on biodiversity and hence on desertification. On the other hand, anthropogenically induced climate change and human pressure on dryland forest biodiversity may independently or jointly damage forest biodiversity to the point that the provision of forest ecosystem services will be impaired, thus exacerbating desertification.

D. Wetlands, biodiversity and desertification

51. *"**Wetlands** are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt"* (Ramsar Convention on Wetlands, 1971). *Wetlands are lands where the water table is usually at or near the surface or the land is covered by shallow water and that have characteristic physical, chemical, and biological features reflective of recurrent, sustained inundation or saturation* (National Research Council, 1995). The Ramsar Convention sees wetlands as a source of water, food, biodiversity and services, and is involved in wetland conservation aiming at promoting their "wise use". At its third session, the Conference of the Parties to the Ramsar Convention (1987) defined "wise use of wetlands" as *"their sustainable utilization for the benefit of mankind in a way compatible with the natural properties of the ecosystem"* and the Ramsar Convention's Strategic Plan, adopted in 1996, equates "wise use" with "sustainable use". Wetlands are not common in drylands, therefore the significance of the existing few there, is great. Nevertheless, of 35 types of wetland recognized by the Ramsar Classification System for Wetland Types, 5 occur in drylands, and of 888 wetlands listed in the Ramsar List of Wetlands of International Importance, 72 are of these five types (Kingsford 1997).

(a) Wetlands and biodiversity

52. Where wetlands do occur in drylands, they are extremely productive and of very high biodiversity and economic value to local populations. They promote fisheries since they provide habitats and act as nurseries for commercial fish. Building materials are also extracted from wetland vegetation by local populations. Wetlands comprise the habitat of water birds (as well as of other plants and animals and their diversity), the protection of which was the initial motivation for the Ramsar Convention. This avifauna is often a source of food for local populations. Several major flyways of migratory water birds and other birds cross drylands, and the wetlands they encounter provide for resting places for the birds, either before, during or after the crossing of drylands of extreme aridity (e.g., the Sahara desert). In this context, the Convention on Migratory Species ("Bonn Convention") is relevant to dryland wetlands. Finally, wetlands are of recreational value, in drylands more than elsewhere, due to the sharp contrast between them and the surrounding landscape. Their rich biodiversity, especially of water birds, contributes significantly to their recreational value, and promotes ecotourism.

(b) Wetlands and water supplies

53. Most importantly for drylands, wetlands are a source of water, for humans, for livestock and for irrigation. Also, floodplains of some wetlands are used for grazing and ephemeral cropping. Hence, where wetlands occur in drylands, their impact on humans is decisive. But wetlands are also instrumental in maintaining quality and quantity of dryland water (and soil) resources. Wetlands are critical in drylands in that they store water during floods and that the downstream release of the water is slow. This ecosystem service lowers flood peaks and reduces water losses and soil erosion associated with dryland floods. The slow movement of the water promotes the deposition of suspended material, and provides for the complete mineralization of organic compounds from local waste-water inputs, and biodegradation of synthetic chemicals that may be transported from outside the region. The slow movement also promotes the development of typical wetland vegetation, which further slows down water movement, reduces the depth of the wetland, and contributes to its spatial expansion, which is instrumental in controlling floods.

(c) Wetlands and desertification

54. In many cases water resource development of drylands involves impounding water sources that nourish wetlands, causing their demise. Another cause of loss of dryland wetlands is deliberate drainage for transformation to agricultural land. Some articles of the UNCCD that call for "water resource development" (article 13 of the African annex), "enhancement and efficient use of water resources" (article 4 of the Asian annex) and "exploitation and efficient use of water resources" (article 4 of the Latin America and the Caribbean annex) should be interpreted as guidelines for attending to the need to guarantee wetland sustainability, rather than reducing the benefit of local populations from their wetlands at the expense of other causes. This is because projects of water impounding, beside causing wetlands salinization and losses of their fisheries and biodiversity, may also cause uncontrolled floods, reduce water availability and increase soil erosion away from the wetland local areas. It should also be taken into consideration that the agricultural production of dried wetlands is short-lived, often resulting in a plethora of environmental and economic damages (e.g., the drainage of the Hula wetland in Israel).

55. Damages caused by non-sustainable management of drylands can be somewhat compensated by creating artificial wetlands - floodwater storage, open reservoirs for controlling the flow of transported water, and open waste-water treatment facilities. Many of these can be stocked with fish and attract water birds and other wildlife. However, other services of natural wetlands, such as potable and irrigation water, fisheries and tourism, can not always be recreated in artificial wetlands. Contracting Parties of the Ramsar Convention are expected to manage their Ramsar sites (Wetlands of International Importance) so as to maintain their ecological character - namely, their essential ecological and hydrological functions which ultimately provide the wetlands' services (COP 7, resolution VII-11, annex).

Such management practices should prevail in all dryland wetlands, as measures to combat desertification.

III. SYNERGIES IN FIELD IMPLEMENTATION

A. Translating linkages to synergies

(a) Geographical extent and transboundary effects

56. The previous section shows how desertification, loss of biodiversity, forests and wetlands, and climate change are interlinked and cross-cutting in the drylands. Accordingly, all Rio agreements and the Ramsar Convention call for sustainable development, sustainable use of natural resources, poverty eradication, capacity-building at all levels and implementation using the participatory approach, international cooperation and integration of cross-cutting issues. It should be noted though, that all countries contribute to and may be affected by the anthropogenically induced global warming, and in all countries biodiversity assets are at risk, though countries greatly vary with respect to their contribution and their sensitivity to climate change and loss of biodiversity. Desertification, however, does not occur in all countries but only in those that have drylands. The geographical extent of drylands is large, yet 53 per cent of global land is not dryland. Still, the effects of desertification (rather than desertification itself) can cross boundaries and affect countries that do not have drylands.

57. Also, all subject-matters of the conventions have cross-boundary effects, and these may be direct or indirect. For example, desertification has two cross-boundary effects, a direct one, and an indirect one. The direct effect is still rather hypothetical: theoretically, desertification in one country may affect local climatic patterns; these may be shared between several countries in the region, such that the climatic response induces desertification in a neighbouring country. The indirect effect of desertification, on the other hand, is well established: due to desertification in one country, environmental refugees pour into a neighbouring country; this does not necessarily cause desertification in the other country, but brings about other social, economic and political problems.

58. With respect to biodiversity, the loss of a species population in one country increases the risk of extinction of this species in the adjacent country; provided that the species occurs only in these two countries, this may mean global extinction. Therefore, many national biodiversity problems are of a global nature, and for this and other reasons, the loss of biodiversity is a transboundary problem. Yet, there are biodiversity losses in one country that have no effect on the biodiversity of other countries. With respect to climate change, emission of greenhouse gases and loss of sink and reservoir in one country, directly and strongly contribute to global warming, hence very strongly affect all countries (though countries vary greatly with respect to the regional expression of the global effect, and their sensitivity to it).

(b) Local and global benefits of implementation

59. There may be another difference not in the direct and indirect transboundary effects, but in the immediate direct benefit at the grass roots of implementing the conventions. Whereas by implementing the CBD and the UNFCCC the immediate economic benefit to local populations is not always tangible, implementing the UNCCD provides a rather immediate direct economic benefit to the farmer, his family and the community to which they belong. Thus, whereas some of the UNFCCC and the CBD commitments may be construed by local communities as top-down, driven by concerns of experts and institutions, the UNCCD is amenable to a bottom-up process driven by concerns at the grass roots motivated by tangible, immediate threats to their livelihood.

60. Table 2 contrasts the geographical extent of desertification with the immediate benefit to local populations of implementing measures to combat desertification. Where the geographical extent is smaller, the immediate benefit of implementing is larger, compared to the immediate economic benefits to a dryland community of reducing the use of fossil fuel, or not cultivating a habitat rich in wild relatives of crops. Furthermore, the cost of mitigating climate change in the energy sector may be much higher relative to the benefit to the local population, than the cost of combating desertification, or promoting local sustainable use of biodiversity. The indirect cross-boundary, political and social effects of desertification are very strong. The indirect effects of biodiversity loss are economical (e.g. the loss of an endemic species with a unique medicinal value will be regretted by people of countries the world over), but their social implications are lower than those of desertification. When the emissions and loss of reservoirs in one country are large, they have a strong transboundary direct effect on the climate of other countries, and the indirect effects - economical and social impacts - are strong too. Thus, while desertification does not directly affect all countries, its overall global effect is similar to that of climate change and loss of biodiversity, due to its cross-boundary indirect (and possibly also direct) effects. Combating desertification therefore strongly benefits all countries.

Table 2. Subject-matters of Rio conventions: immediate benefit of implementing the relevant convention, geographical extent and cross-boundary effects of the phenomenon

	Immediate economic benefit of field implementation of the convention	Geographical extent	Cross-boundary effects	
			Direct	Indirect
Desertification	+++	++	+	+++
Biodiversity losses	++	+++	++	++
Climate change	+	+++	+++	+++

[+ small; ++ moderate; +++ large (benefit, extent, effect)]. For discussion see text.

61. Due to the linkages discussed earlier, a desertification-affected country taking measures, for example, to curb use of fossil fuel and set aside area for conserving biodiversity, but not to combat desertification, still contributes to climate change and loses biodiversity due to the effects of land degradation on these processes. It is therefore beneficial for desertification-affected countries to combat desertification, for the sake of combating desertification and also for the sake of the benefits accruing from their biodiversity and the preservation of their climate system. By the same token, it is also beneficial for non-affected countries to assist affected countries to combat their desertification. By that, the non-affected countries relieve themselves of the indirect transboundary effects of desertification and the direct and indirect cross-boundary effects of loss of biodiversity and climate change.

62. Thus, implementing the UNCCD in affected countries does not only benefit the farmer out there in a dryland country. It also benefits other countries the world over, with respect to their concerns and aspirations related to climate change and biodiversity, and it does this at a relatively low added cost. This benefit may and can s nergize the combat against desertification. In the following section, strategies to combat desertification will be reviewed and their effects on the subject-matters of other conventions, effects defined as synergy, will be elucidated.

B. Strategies to combat desertification in synergy

63. The unifying feature of drylands is that their biological production is limited by water. This limits the use of drylands as rangelands, and their potential for agricultural development. Furthermore, non-agricultural and non-pastoral developments such as industries and human settlements are limited by water too. Water limitation in the drylands results from both low precipitation and high evaporation. Drylands vary with respect to these features, and are accordingly

categorized by the ratio of actual water input (precipitation) to potential losses by evapotranspiration (the aridity index). Lands with precipitation lower than 65 per cent of evapotranspiration are regarded as drylands and comprise 47 per cent of global land (Middleton & Thomas 1997).

64. The less arid a dryland is (the greater is its precipitation/potential evapotranspiration ratio), the more likely it is to come under development pressure resulting in land degradation. At the same time, the less arid a dryland is, the more resistant and resilient it is to degradation and therefore its desertification can be arrested and reversed with greater ease. The most extreme drylands are the hyper-arid ones, with precipitation less than 5 per cent of potential evapotranspiration. Due to their extreme aridity hyper-arid drylands rarely come under heavy development pressure, hence these 7.5 per cent of all drylands are not potentially at risk and therefore not covered by the mandate of the UNCCD.

65. Other dryland types are, in declining order of aridity, the arid, the semi-arid and the dry sub-humid drylands, all prone to desertification. The differences between these dryland types are reflected in differences in their desertification risks and hence each requires a different strategy for combating desertification and for synergy. The following represents a theoretical revue of options for countries and regions corresponding to the respective ecosystems presented below. Such options however may not materialize uniformly and strongly depend on local socio-economic conditions. In many instances, conditions-specific strategies for poverty alleviation may be called for.

(a) The arid drylands

Features

66. Arid drylands comprise 12 per cent of global land. Most are not subjected to population pressures, hence are not at risk. However, where they do come under heavy population pressure, their risk of becoming desertified is very high. Arid drylands are traditionally used as range, by nomad pastoralists. In some regions, though, population pressures are likely to intensify, leading to degradation of the rangeland and to its transformation to cropland.

67. With their low precipitation and high potential evapotranspiration, arid drylands depend on irrigation for water inputs and agricultural development. Since all developed water resources are more saline than those of direct precipitation, and given the high evaporation rates, there is a high salinization risk. Water resource development requires high technology and capital investments, which can be provided only by an enabling structure. This is rarely available in countries with arid drylands. Furthermore, even where the cost of water resource development and prevention of salinization is lower than that of the increased production, the cost of food production in the arid drylands remains higher than in dryland of lower aridity and in non-dryland ecosystems.

Strategies for combating desertification

68. It is cheaper to increase the food production of already high-productivity ecosystems, than of ecosystems with inherent low productivity. Therefore, rather than develop arid drylands for subsistence agriculture, alternative uses that can generate more income if carried out in arid drylands than in other ecosystems, should be considered. This income will enable the inhabitants of the arid drylands to import food from ecosystems where the production of food is more profitable. Some of these options are described below.

(i) Competitive cash crops: During seasons when many regions experience low temperatures and sun radiation, arid drylands are relatively warm and sunny. What limits agricultural production then in arid drylands is water. Dryland greenhouses reduce evaporation and thus make water use efficient. Methods of cooling the greenhouses in the daytime and warming them at night with very little input of fossil energy are available. A spin-off of growing the crops in greenhouses is the ability to fertilize them with gaseous carbon dioxide. The controlled environment within the greenhouse allows agricultural production to be intensified. The product is marketed in colder regions as an off-season crop fetching high prices, while its cost of production is lower than if produced elsewhere.

(ii) Production of fish and crustaceans: Fish, shrimp and prawn production in drylands sounds like an oxymoron. Yet, dryland brackish water, detrimental to many crops and soils, is favoured by the physiology of many commercial fish and other aquatic organisms. Furthermore, water use efficiency is achieved by raising the fish in greenhouses and by circulating the water, or by farming several fish species with differing demands, whereby one thrives on the water effluents of the other. Freezing temperatures that are lethal to many commercial fish and crustaceans, are avoided in many arid drylands. Finally, arid aquaculture does not compete with agriculture on precious land and water, as it often does in non-dryland regions.

(iii) Algae and algal products: This is another apparent oxymoron, yet an opportunity for arid drylands' people. Unicellular, micro-algae produce faster than other crop plants, and therefore may be more efficient. Like agricultural crops, algae need much sunlight and benefit from warmth during the cold season. But unlike crop plants, algae do not lose water through transpiration. Unlike many crops but like fish, algae thrive on the low-quality dryland water. Algae are grown in drylands in greenhouses or in other devices that prevent evaporation and enable circulation of water. They can be grown in drylands faster and cheaper than in any other non-dryland region. Micro-algae can be grown for diverse uses. Whole cells can be used as food for fish larvae. Or, precious chemical compounds, like pigments, food additives, vitamins, enzymes, cosmetics and pharmaceuticals, are extracted from the cells. The ratio of produced product per unit of water used is much higher in algae than in other crops, since the ratio of economically useful parts to other parts of the biomass is much higher in algae than in higher plants.

(iv) Commercial production of solar energy: Solar energy is more abundant, and there is more space to intercept and concentrate it in arid drylands than in less arid drylands and in non-drylands. Investments in solar energy research and development can make the inhabitants of arid drylands exporters of solar energy. Solar energy can also be used to reduce the high cost of energy expended in desalination plants, and thus make use of the brackish water often available in arid drylands. Solar power stations can be installed in small and large dryland settlements, and the electricity generated locally will be cheaper than that obtained from afar, to which the cost of transmission has to be added.

(v) Recreation and tourism services: Many arid drylands are of unique scenic value, which, together with their vast open expanses and sparse human population, makes them attractive for leisure activities to affluent populations residing in non-drylands. Tourism may generate more income for dryland inhabitants than other types of development. The tourism industry, however, requires much water for consumption and much energy for indoor climate control. Technologies for recycling domestic water and for "passive" cooling of buildings under arid conditions (typified by dry air which is the prerequisite for passive cooling) contribute to development of arid area tourism as an alternative source of livelihood.

Synergies

69. The unifying feature of the above five options is that either their demand for land and water resources is low, or the livelihood they support reduces this demand. If carried out in already desertified land, they relieve that land from the pressures that had brought about its desertification, and enable its restoration.

(i) The conservation of biodiversity: Plant and animal populations of arid dryland species are small, hence to reduce the risk of extinction of dryland species, the required areas for their sustainable use and conservation should be larger than in the non-drylands. Therefore, dryland livelihoods that economize on land use allow land to be set aside for sustainable use and in-situ conservation of biodiversity. Biodiversity assets of arid drylands that can be promoted in this way are many. Arid plants have evolved chemical compounds for protecting them from the harsh environment and the many herbivores. These are to be discovered, developed and commercialized. Arid drylands are rich in plants of medicinal, aromatic and stimulant value, which are used locally and marketed. Arid species, especially cacti, are valued as ornamentals. Other arid plants have evolved to withstand salinity ("halophytes"), typical of many arid soils. If these are bred to generate commercial value, they can be used to rehabilitate dryland cropland salinized by irrigation. Finally, dryland wildlife is an ecotourism asset. Due to the openness of the habitat, dryland wildlife is relatively conspicuous; and combined with the predictability of the weather, dryland ecotourism is a highly competitive economic option. Thus, alternative livelihoods as options to combat desertification reduce the risk of habitat loss and extinction. The protected

biodiversity can then provide additional alternative livelihoods, thus further contributing to the combat against desertification.

(ii) The mitigation of climate change: The release of pressure on land has several effects: (a) it contributes to the mitigation of climate change, since the intact vegetation serves as a carbon sink and reservoir. Though the extent of vegetation cover is relatively low, arid drylands constitute a significant portion of global land; (b) the alternative, of extensive and intensive use of the land, causes an overall release of carbon from the reservoir to the atmosphere, and reduces the sink function of the vegetation; (c) the efficient use of fertilizers and the reduced amount of pesticides in the insect-proof cash-crop agriculture reduce the emission of several greenhouse gases. Finally, the use of solar energy contributes to averting global warming and climate change; solar energy, not only for use in the drylands but also as a dryland export, may check the ever-increasing use of non-renewable fossil fuel and its associated emission of carbon dioxide.

(b) Semi-arid drylands

Features

70. Semi-arid drylands cover the largest land area - 18 per cent of global land (or 38 per cent of all drylands). They are exposed to an intermediate population pressure and have an intermediate resilience. These two features combined make them most prone to desertification; they suffer an intermediate pressure, but their ease of restoration is also intermediate. Thus, when combating desertification, semi-arid drylands pose the greatest challenge, due to their inherent properties and to their geographical extent. Indeed, though pastoralism and subsistence agriculture are the traditional uses of semi-arid drylands, with the mounting population pressures these uses cause land degradation. Combating desertification of the semi-arid drylands should not only mean restoring the desertified areas and arresting further desertification, but also increasing productivity to cater for the growing population.

Strategies to combat desertification

71. With more precipitation and less potential evapotranspiration, the cost of increasing inputs and reducing losses of water is not as high as in arid drylands. Two options are recommended. First, a promising strategy for increasing rangeland productivity without risking desertification and for circumventing the need to convert whole rangelands to croplands, is the integrated watershed management approach. This approach allocates different ecosystems within a watershed to free range, afforestation, agroforestry, and fodder production, in a way that maximizes run-off harvesting and storage. The second approach is that of intensive yet sustainable agriculture. This includes integrated water resource development use and re-use, drip irrigation and subsurface irrigation with treated waste water, the breeding and introduction of drought- and salinity-tolerant crops, conservation tillage based on mulch farming and residue return, frequent use of cover crops in

the rotation cycle and elimination of ploughed fallow, integrated nutrient management based on compost, biosolids and chemical fertilizers, and integrated pest management (especially weed control). Yet, food production may still be more expensive and risky to the soil (salinization, erosion). Therefore, cash-crop agriculture and aquaculture, as well as ecotourism may be viable options, not only in arid dryland but in the semi-arid drylands as well, provided an enabling environment exists.

Synergies

(i) Intensive agriculture and carbon sequestration: Cropping practised in a locally intensive manner within the appropriate sections of the watershed, may restore the soil carbon sequestration capacity of the semi-arid (and the dry-sub-humid) dryland, and re-fill their lost soil carbon reservoir, estimated as 25 Pg carbon, globally (Lal 1999).

(ii) Biodiversity and mitigation of climate change: Semi-arid regions often function as "desert edges", across their space the position of this boundary fluctuates between years, in accordance with natural climatic vagaries. Many desert species extend their distribution into the semi-arid dryland, but they can not invade less arid regions. Many non-desert species extend their peripheral distribution to the semi-arid region, but they can not invade more arid regions. A plant of a non-desert species, for example, residing in the semi-arid periphery of its species' distribution, and its genetic makeup being adapted to wet years, produces during such years more seeds than another neighbouring genotype. The latter, adapted to dry years, produces in wetter years fewer seeds than the former genotype. The two peripheral genotypes thus fluctuate in frequencies between years, but neither of them becomes extinct. In the permanently wet core area of the species distribution, only genotypes adapted to wet conditions survive, and there are no genotypes adapted to dry conditions. Peripheral populations may therefore withstand global warming, whereas core populations of the same species may become extinct. Semi-arid ecosystems are repositories of the resistant peripheral populations that may be used for restoration and rehabilitation of ecosystems elsewhere, when affected by climate change. Land in semi-arid regions, released due to the prevalence of alternative livelihoods, can be used for such *in situ* conservation. A system of synergy-oriented incentives for such conservation by the local communities is yet to be conceived and established at the international level.

(c) Dry sub-humid drylands

Features and strategies to combat desertification

72. These areas comprise 10 per cent of global land and are the least dry of all drylands. Their traditional use is for transformation to cropland in the valleys and plateaus, and pastoralism on slopes covered by scrub or parkland. Current development is transforming mountainous rangelands to croplands. Food production is more profitable in the dry sub-humid drylands than in other drylands. But much

dry sub-humid agriculture requires irrigation, hence investment in water resource development is coupled with risks of soil and groundwater salinization. Also, since the amount of rainfall in dry sub-humid drylands is relatively large, improper soil-management practices lead to a high rate of water-caused soil erosion. But at the same time this relatively high amount of rainfall is conducive to afforestation, which is instrumental in arresting soil erosion and providing firewood, provided this afforestation is not a monoculture, and is compatible with the local biodiversity.

Synergies

(i) Carbon sequestration by afforestation and agriculture: Dry sub-humid afforestation practised for combating desertification via its role in arresting soil erosion is also effective as a carbon reservoir and sink. Temperate non-drylands are ecologically more suitable for afforestation than any dryland type but this is also true with respect to food production. However, since food production has priority over afforestation, from a global perspective it is optimal to use non-drylands for food production and drylands for afforestation. Of all dryland types, it is mostly in the dry sub-humid that afforestation is ecologically feasible and hence also economically viable. Thus, afforestation in dry sub-humid areas, hitherto used mostly for the production of firewood, conservation of soil and promotion of landscape quality, recreation activities and biodiversity, can also become instrumental in mitigating global warming. The polluting sectors of the non-dryland regions may provide incentives to dryland populations for using their land for such afforestation, rather than maintaining traditional land uses, that may cause desertification and hence generate less income. Where cropping is practised in the dry sub-humid dryland, it will mitigate climate change by carbon sequestration, provided intensive practices as described in the relevant section dealing with semi-arid drylands, are applied. *In-situ* conservation of wild relative and field races of cultivated plants, often common in dry sub-humid lands and significant for local and global food security, may be integrated within afforestation schemes.

(ii) Natural and artificial wetlands: Dry sub-humid drylands have more wetlands than other drylands, and usually harbour dense human populations, as compared to other dryland types. Thus, much of the relatively more abundant water of dry sub-humid lands is allocated to domestic uses. The treatment of this water is required to comply with environmental regulations, and increasingly also for recycling, to become irrigation water. Since the supply of waste water is not seasonal and is relatively stable, recycled treated domestic waste water can sustain dry sub-humid agriculture that is well irrigated and can be perennial (i.e., orchards, etc.), thus protecting the soil from erosion the year round. Waste water treatment on a large scale requires extensive artificial wetlands, and can also be facilitated by natural wetlands. This can provide an incentive for protecting dryland wetlands against overexploitation of their high-quality water resources. Combined, the protected natural wetlands and the managed artificial ones conserve, attract and protect aquatic biodiversity and provide recreation services. To

conclude, measures for preventing desertification while expanding agricultural production in dry sub-humid drylands nourished by treated waste water, promote at the same time wetlands and their associated wildlife.

(d) Summary of field implementation options

73. The rationale behind the proposed options for field implementation is the perception of drylands as ecological systems that can not be transformed to non-dryland ecosystems in an economically viable and hence sustainable manner. The proposed strategies are based on those dryland attributes that can be harnessed to provide dryland inhabitants with an **economic competitive advantage**. For example, the dryland curses of intense solar radiation, high temperatures, low-quality brackish water, and desolation and wilderness can be turned into the blessings of solar energy, winter cash-crops, aquaculture and tourism, respectively. All these can be produced in drylands at **lower** economic and environmental costs than in the non-drylands. This is provided that options for development and for combating desertification are not applied indiscriminately in all drylands. Rather, each is matched with the ecological as well as the socio-economic environment in which that option is most likely to result in short-term as well as long-term economic benefits to the population (table 3). It should be noted that these options do not require advanced technologies, which are beyond the capacity of local populations to acquire and operate. The research on these technologies is sophisticated, but their transfer and adaptation is often straightforward. Yet, the successful application may in many cases depend on an enabling socio-political fabric and infrastructure. Even where the socio-political environment is not conducive, indigenous knowledge and local practices can be further elaborated, developed and adapted for exchange between regionally cooperating parties. The exchange of local experience and expertise between neighbours may be more effective than adoption of imported technologies.

Table 3. Dryland type-related attributes and strategies

	Constraints to development	Economic potential	Combating desertification	Synergistic impacts
Arid drylands	Agricultural development heavily depends on expensive water resource development	Warmth and solar energy, brackish water ideal for aquaculture, scenic wilderness and "charismatic" wildlife	Cash-crop "greenhouse" agri- and aquaculture, solar energy production, ecotourism	Release of land resources for conservation of biodiversity, and carbon source and sink function. Use of solar energy to reduce GHG emissions
Semi-arid drylands	Highest desertification risk due to a combination of population pressure and ecosystem fragility	Relatively high water availability, occurrence of relatively rich, economically significant biodiversity	Integrated watershed management: agro-forestry, free-range and fodder-fed livestock, run-off harvesting, treated waste water irrigation, cash-crop agri- and aquaculture, intensive but sustainable agriculture, community-based use of biodiversity	Integrating conservation of genetic biodiversity with potential to withstand climate change, used for restoring climate-change damaged ecosystems; restoring carbon sequestration potential
Dry sub-humid drylands	High population pressure, soil erosion by floods	Lower fragility, subsistence farming is relatively profitable and less risky	On top of farming, extensive afforestation, instrumental also in soil and water conservation	Carbon sequestration of forests integrating wetland conservation with waste water agricultural reuse

74. Combating desertification does not conflict with conservation of biodiversity, and conserving biodiversity and mitigating climate change do not hinder the development of drylands and do not constrain the livelihood of local communities. Rather, the strategies for combating desertification and at the same time conserving biodiversity and/or mitigating climate change, summarized in table 4, may also yield immediate benefits to the local populations.

75. It should be noted that most of the proposed strategies do not put pressure on the dryland natural resources. Therefore, **by default**, they also contribute to the conservation of biodiversity and to the mitigation of climate change, and constitute win-win options. Thus, on the one hand, dryland people do not have to compromise their income or to make special investments in biodiversity and carbon sequestration. On the other hand, dryland people can and should take advantage of the global concern over the detrimental effects of climate change and loss of biodiversity. They should therefore publicize their activities and successes so as to encourage beneficiaries to reward them for their regional and global contributions that range far beyond the scope of combating their local desertification. In this way the proposed win-win strategies will synergize the combat against desertification.

Table 4. Actions and their relation to the agreements

	UNCCD	CBD	UNFCCC	Forest Principles	Ramsar -Wetlands
Integrated watershed management: agroforestry (firewood, fodder, annual crops), run-off harvesting for trees and range	No overexploitation of local water hence low salinization risk; run-off harvesting, terraces and trees conserve soil	Conserves much of the watershed's biodiversity, utilizes parts of it thus contributing to overall sustainability	Maintains soil organic carbon and above-ground vegetation as carbon sink and reservoir	A type of dryland afforestation, that may contribute to groundwater recharge	Wetlands may be incorporated in watershed management, and provide water for sustainable use
Intensive but sustainable cropping (drought- and salinity-resistant high-yield crops, etc.)	Increased agricultural productivity with no soil erosion and salinization	Local biodiversity may be used to improve crops, or to provide new crops	Reclaims soil carbon reservoir by re-sequestering soil organic carbon, and maintaining sink function		
Intensive greenhouse agri- and aqua-culture (cash crops, fish, industrial materials from algae)	High income per unit soil and water used, thus economizing on land and water resources	Reduced pressure on land leaves habitats for in-situ biodiversity conservation, thus promoting its utilization	Reduced pressure on land (a) maintains carbon sink and reservoir; (b) allows conservation of biodiversity resistant to climate change	Reduced pressure on dryland woodlands	Reduced pressure on wetland water resources
Use of treated waste water for agriculture, range, tourism	Reduces water overexploitation hence salinization of groundwater	Promotes rangeland biodiversity	Conserves wetland water resources	Promotes afforestation by irrigating saplings with treated waste water	Conserves wetland water
In-situ conservation of biological resources, wildlife conservation	Potential for economic exploitation as an alternative livelihood; promotion of ecotourism	Global benefits from dryland biodiversity assets	Conservation of genetic diversity instrumental in restoring climate-change damaged ecosystems		Protection of wetland biodiversity, and hence other wetland services
Ecotourism, wildlife tourism	Diversifies sources of income, reducing resource overexploitation in droughts	Increases awareness of wildlife conservation			Uses wetlands for recreation
Run-off harvesting for afforestation	Soil conservation, firewood substitutes vegetation use	Improved soil water regime for wild vegetation	Increases carbon sink and reservoir	Increases afforested area	
Local use and potential for commercial production of solar energy	Reduced need for firewood maintains soil vegetation cover, preventing soil erosion	Reduced need for firewood conserves plants and their associated animal species	Substitution of fossil fuel with non-emitting energy; reduced need for firewood conserves carbon sink	Reduced need for firewood conserves forests	

C. Action plan for synergies

(a) Principles

76. Based on the previous section, it is now appropriate to integrate the strategies for combating desertification and their synergistic effects, into an action plan to achieve synergies. The UNCCD action plan for synergies is based on several principles. None of these is entirely new, and they may already be implemented in one way or another by local communities practising a holistic approach to resource use. Yet, putting them in one framework provides an opportunity to initiate a constructive discussion on synergizing the UNCCD at the field implementation level.

The two phases - local demonstration and country-wide action

77. The plan has two phases. In the first phase, integrated local area programmes will be designed in a participatory approach, involving the relevant local community and co-financed in partnership, pursuant to articles 5, 6, 9, 12, 13, 14, 20 and 21 of the UNCCD. These projects will then be carried out and not only serve their communities but also perform as demonstration sites in their countries and subregions. However, the success of such single pilot ventures in bringing benefits to the community in which they have been implemented, and even in serving as demonstration sites, is not likely to alleviate desertification in the affected country as a whole. To achieve this, which is the ultimate goal of the UNCCD, a second phase of an entirely different nature is required. The second phase will be carried by not just involving a participatory approach, but by generating a bottom-up approach in its fullest sense. During the second phase, which will probably shape up long after the initiation of the first phase, local communities throughout an affected country will be sensitized by extensive and in-depth work of trained local facilitators, that will create the enabling conditions for repeating the success of the pilot projects on a whole-country scale.

Multi-stage planning and decomposing benefits

78. The second principle is the sequential multi-stage development of the plan, in which win-win actions, or "default synergies" are identified, then their benefit is decomposed into local, national and global "portions". Later, additional actions related to subject-matters of the other conventions are considered, and decomposed into local, national and global "portions".

The significance of the incremental cost

79. The third principle is that of adressing the issue of "incremental cost". Additional national action beyond what is required for combating desertification imposes additional (or "incremental") costs on countries beyond the costs that are strictly necessary for achieving their own dryland sustainable development goals, but nevertheless generates additional benefits that the world as a whole can share.

Reduction in the emissions of greenhouse gases and protection of specified biodiversity are examples of such global environmental benefits. Countries that synergize the combat against desertification may incur incremental costs in order to realize global environmental benefits. A simplified example of such action is the use of advanced solar energy technology in a situation where a less costly coal-fired power generator with pollution control would have been sufficient to generate the electric power needed for pumping irrigation water, while meeting reasonable environmental standards. This action, the choice of solar power over coal, imposes an incremental cost and avoids emitting the greenhouse gases that would otherwise be emitted. Yet it still meets the same national development goal (development of water resources) while also protecting the national population from pollution, in accordance with reasonable standards. In such a case, the incremental cost is associated with the global environmental benefit of reduction in greenhouse gas emissions.

Awareness-raising and the facilitators

80. The fourth principle is that of awareness-raising. This is the most critical element for synergy. Awareness of the ecological linkages and of the added benefits of measures to combat desertification should diffuse from bottom to top in order to generate support for the programme, hence to create the synergy. Facilitators specially trained for this task, and instruments to recruit, train and assign these facilitators are the major capacity-building element of the action plan for synergies. In the following, these principles are elaborated on as only one example of their implementation.

(b) First phase - synergizing by integrative local area programmes

The general approach

81. In this phase, a selected affected country Party would carry out a programme involving one local community or/and one watershed or ecosystem in which the UNCCD implementation will be synergized by implementing also one or more other conventions, or will address one or more focal areas of the GEF. This might be undertaken as an integral part of the national action programme to combat desertification (NAP). It may also be integrated into a plan for a dryland biosphere reserve.

82. Planning the programme may comprise the following stages (fig. 1):

(i) A government organization, a non-governmental organization or a partner, or any other appropriate body, will select a site, an ecosystem and a local community for implementing the synergized, integrative pilot programme. The site may, when appropriate, be a component of the national action plan of the country;

(ii) The selecting body, via a participatory process with the local population, will identify the expressions, extent and severity of desertification, design a project for combating desertification via a whole watershed approach, and then perform a cost-benefit analysis for this programme;

(iii) The elements of the designed programme, which will also address biodiversity, climate change, forests and wetlands (the "default" synergies), will be identified and their share in the overall cost will be estimated. They will also be divided into elements that are of local significance only, and elements that are of global benefit, and the costs will be divided accordingly, so that the incremental cost, if it exists, can be singled out;

(iv) The programme design will now be modified to increase the benefits to the community from respecting the other conventions (a) without compromising the combat against desertification, or even (b) in a way that makes combating desertification more effective. The focus of "synergizing" (i.e., including programme elements that reflect the commitments to other conventions) will first be the national benefit. The same added programme elements will then be evaluated for their global benefit. Additional programme elements that have only global benefits can then be added. This latter version of the project programme is likely to have an incremental cost, which will be calculated;

(v) The programme plan will then be iteratively modified until the cost of combating desertification by optimizing it with attending commitments of the other environmental agreements and GEF's focal areas, is minimized and the sustainable benefit to the local community is maximized. If reducing the efficacy of combating desertification but increasing, for example, the benefit from biodiversity can maximize the benefit to the community - this alternative should be taken into consideration too. The breakdown of the benefits against the costs (just combating desertification, the "default" synergies of national benefit and the default synergies of global benefit, added synergies of national benefit, added synergies of global benefits) will be listed and calculated for each iteration and option. Thus, the reasons for selecting the preferred option will be transparent and easy to evaluate;

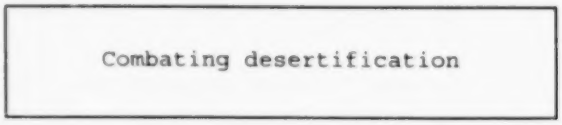
(vi) The produced programme document with the above costing will be presented to the Global Mechanism (GM), which will assist with allocating financing and co-financing sources, implementing agencies and options, including the private sector;

(vii) Reporting of the project progress and results will be carried out through submission not only to the funding agencies, implementing organizations and government in question, but also to the UNCCD secretariat. The reports will not include separate sections for each of the other legally binding instruments and GEF focal areas, but will be holistic, integrated reports, reflecting the spirit of the reported project. The reports may be then submitted by the UNCCD secretariat to the other relevant secretariats for their consideration. This reporting procedure should relieve the governments from duplication of reporting efforts, and make the work of various secretariats more efficient.

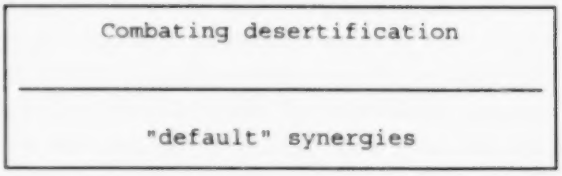
83. Once the programme is funded and implemented, the site may become a demonstration site, and serve as a focus to extend the use of synergies and create awareness for them. Some of the sites may also be used for a long time as benchmarks, to be continuously monitored for demonstrating the long-term effects of the project on conservation and sustainable use of biodiversity, on soil carbon sequestration, and at the same time on restoring land productivity and providing a decent sustainable livelihood to the local populations.

Fig. 1. Stages in planning, phase one - compartments represent cost/benefit

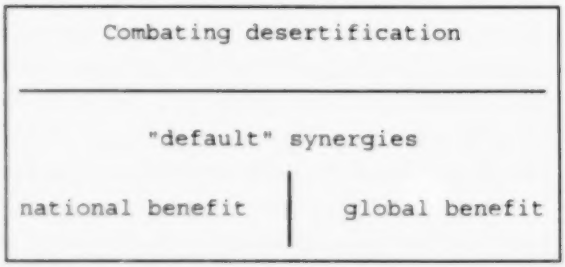
(1) Combating desertification with no apparent synergies



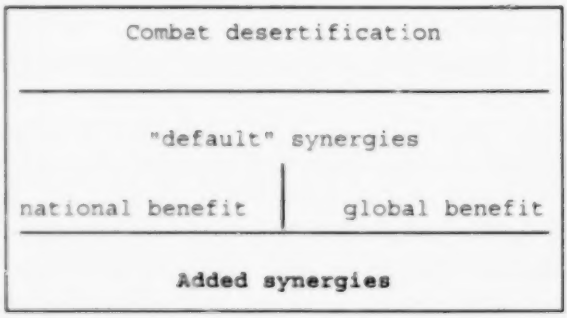
(2) Elucidating the "hidden" or "default" synergies



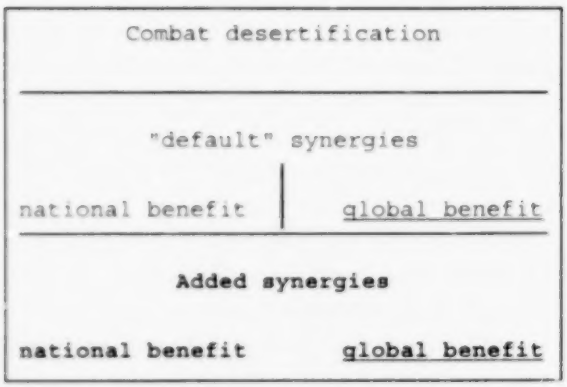
(3) Distinguishing between "default" synergies of national and of global benefit



(4) Adding synergies not directly related to combating desertification



(5) Distinguishing between added synergies of national and of global benefits (incremental costs are underlined)



(c) Second phase - Synergizing at the community level

The benefits of synergizing the combat against desertification

84. Whereas local populations are often aware of the expressions of desertification in their land, realize the associated damages and are eager to repair the damages and avert the causes (i.e., to combat desertification), the awareness of the concepts of sustainable use and conservation of biodiversity and mitigation of climate change are likely to be weaker. Also, whereas the combat against desertification generates direct and often immediate benefits to the local population, the benefits of action taken by them to conserve biodiversity, and especially to mitigate climate change, are usually not so obvious. However, the latter are beneficial to their countries as a whole, especially if they are contracting Parties to the CBD, UNFCCC or the Ramsar Convention. It is therefore necessary to raise the awareness of local populations of the direct benefit to them of combating desertification in ways that also conserve biodiversity and mitigate climate change. Community leaders will thus make their governments aware of the added national benefits generated by the efforts of their communities to improve their lot. This may eventually lead to local communities being compensated for their efforts to benefit the country and its government. Governments may then be more inclined to support their communities in the combat against desertification.

The "bottom-up ladder" of awareness-raising

85. The scenario just described demonstrates the "bottom-up ladder" of awareness-raising - from the low rung of raising the awareness of local populations, through raising awareness of governments of affected countries (where awareness may be weaker than among local communities), to the upper rung of raising awareness of other countries and international organizations. The success depends on the lowest rung, namely, raising the awareness of the local populations. Local people will become aware of the benefit of synergizing if (a) they are knowledgeable about the technical issues, namely, the value of biodiversity and the threat of climate change; and (b) they can assess the costs and benefits to themselves, as against the benefits to their countries and governments.

86. Local communities and their leaders should be informed in order to be able to meet these two conditions. Much has been said about local education campaigns, remote teaching and educating via the Internet. However, campaigns are not as effective as constant involvement, and remote teaching and the Internet are not a viable option in most local communities. In order to be informed via computer, each person must sit comfortably in front of a screen and study in an interactive manner. The resources for that simply do not exist. Therefore, professional educators or trainers (or "facilitators", to use World Bank jargon) should be active in the local communities, and preferably should come from among these communities. Thus, each affected country should have a cadre of facilitators whose function is (a) to initiate the required train of events and raise the awareness of local populations; and (b) once the "ladder" is climbed successfully and support is raised - to

facilitate carrying out synergized projects by the local communities, or even by whole regions.

The cadre of local facilitators

87. The Sede Boqer Workshop on "Synergies in National Implementation" noted that *"Outside intervenors have the difficult tasks of forging the links between top-down policies (which are inevitable in international instruments) and bottom-up actions (which are essential for lasting results). As such, they need training to become* ***facilitators*** *of locally-owned processes rather than the enforcer of nationally-imposed plans"*. In some countries, a model for local-level synergy involves the use of existing extension agents. In theory, these government agents have the most regular contact with the population and have the benefit of being able to function as liaison between government and community. Extension agents may involve existing community-based organizations and institutions at the village level in identifying priorities and in planning. When properly trained, they are able to communicate effectively with villagers and can assist in several areas, such as in monitoring, accessing information, and approaching partners. They are the best instruments for capacity-building among local populations.

88. Yet, for the task of synergizing the combat against desertification, a focused, concerted effort is required. A cadre of facilitators should first be created and then the operation of the facilitators has to be enabled and maintained. At the request of the COP, the role of the secretariat might be to commission, design, plan, propose and promote the tools and mechanisms (a) for creating this cadre and (b) for enabling its operation. For creating the cadres, the following activities are required: (a) creating a teaching and training programme; (b) allocating and accrediting existing facilities or institutions that will adopt and carry out the programme; (c) creating a mechanism for selecting the trainees; and (d) raising financial support for carrying out the training. For enabling the operation of the cadres it is necessary to: (a) prepare work programmes for the facilitators; (b) allocate the facilitators to local communities and regions; (c) raise financial support for carrying out the work of the facilitators; (d) monitor the work of the facilitators and its impact; and (e) designate or establish the facility, organization or institution that will carry out the above activities.

The facilitator's qualifications

89. In order to carry out his/her mission, synergizing the combat against desertification by local communities in affected areas, the facilitator should be knowledgeable in the areas of desertification, biodiversity, climate change, forestry, etc. To train a person in all these areas may seem an impossible taks. But given that the final product is not a scientist or a researcher but a trained programmer, it is not as insurmountable as it may seem. There are pros and cons either for assigning this task to academic or vocational institutions, or for creating a special training organization. The educational prerequisites for candidates selected for the training programme should be determined. A balance

should be sought between the need for sufficient professional background and the need to have facilitators coming from the local communities. It is necessary that the selection procedure of candidates and the process of allocating the certified facilitators to local communities, will be according to pre-determined criteria, and fully transparent.

The facilitator's mode of operation

90. The facilitator's role as an educator, sensitizer and source of information is straightforward. However, the major challenge is the valuation of the investment of the local community in synergizing the combat against desertification, and the valuation of the direct benefit to the local community, the benefit to the country as a whole, and even the global benefit. A hypothetical example of the dimensions of the task may be the fate of a site suffering from soil erosion due to overgrazing. At least three options for combating desertification exist. The first is to cease grazing by removing livestock altogether and build terraces to slow down run-off. Lost soil is thus replaced by soil carried by the slowed-down run-off and deposited on the terraces. This is a practice for combating desertification, with no linkages, hence no potential for synergy. The second option is not to transform this indigenous rangeland into cropland, but to re-introduce controlled grazing following the terrace-induced rehabilitation. This option also promotes biodiversity, whereas the first option reduces biodiversity. The third option is to use the newly terraced site for afforestation, or agro-afforestation. This option has the potential to synergize the combat against desertification by contributing to the conservation of forests, by mitigating climate change and by promoting biodiversity.

91. The role of the facilitator is (a) to make the local population aware of the existence of the three options, from the technical viewpoints; and (b) to evaluate the investment made by the local population in each of the options, against the value of benefits - direct benefit to the local population of just combating desertification (crops, livestock, reduced flood damage and soil movement, for each of the three options respectively), direct benefit of synergizing (herbal and medicinal plants for local use, and firewood, for the second and third options, respectively), and indirect benefit of synergizing (reward from the government for promoting the persistence of populations of significant species, and for the sink and reservoir function of the planted forest - provided the facilitator is informed that this is a tangible option). Also, since desertification is expressed also in loss of carbon reservoir (by loss of the soil organic matter), then even just combating desertification (the first option) with no linkages, contributes to mitigating climate change, and therefore may deserve some reward and will become a synergy. It is clear from this example that the facilitator should have expertise in agriculture, forestry, combating desertification, biodiversity and climate change, as well as in rural planning, economy and social sciences. This comes on top of having negotiating and public relations skills, and knowledge of the culture and languages of local populations as well as the structure of local and national

government. The generation of the infrastructure, instruments, and institutions that will mould these local facilitators, is the major challenge of the UNCCD.

IV. PARTNERS FOR SYNERGIES

92. It is clear from the previous section that in order to implement actions having linkages to other conventions as leverage for synergies, such that additional resources will be allocated to combating desertification, country Parties and the institutions of the UNCCD need to look for partners who may benefit too from the combat against desertification. In the following, some of these potential partners are listed and discussed. Concerted effort will be required to harmonize and integrate between these partners, so that the synergy in their work will facilitate the synergy in field implementation, through the proposed framework of the action plan for synergies.

A. Global Environment Facility

(a) GEF and UNCCD

93. The UNFCCC and the CBD both named GEF as the operating entity of their financial mechanisms, and these conventions require that new and additional resources be used to finance the "agreed full incremental costs" of measures taken to meet the objectives of the conventions. Thus, affected developing countries that are also parties to the UNFCCC and the CBD need not divert scarce development finance to achieve global objectives nor give up their national development goals to do so. This is because the incremental cost of the actions that synergize their combat against desertification can be borne by GEF. Article 20.2(b) of the UNCCD states that *"Developed country Parties ... undertake to promote the mobilization of adequate, timely and predictable financial resources, including new and additional funding from the Global Environment Facility, of the agreed incremental costs of those activities concerning desertification that relate to its four focal areas, in conformity with the relevant provisions of the Instrument establishing the Global Environment Facility"*.

94. Indeed, GEF recently stated that the agreed incremental costs of activities concerning land degradation, primarily desertification and deforestation, as they relate to GEF focal areas (e.g. biodiversity, climate change, international waters), are eligible for GEF funding: *"Activities for prevention and control of land degradation can be considered for GEF funding in so far as they yield global environmental benefits in one or more of its focal areas. The GEF will undertake programming in the interface between land degradation and its focal areas, with a view to enhancing and sustaining global benefits in climate change, biodiversity and international waters"* (GEF, 1996. A framework of GEF activities concerning land degradation). Thus, GEF financing in the area of combating desertification can be just one component in a collaborative effort. As GEF strives to achieve global benefits, it will also facilitate countries' efforts to implement the UNCCD, and furthermore the Forestry Principles, which are linked with the UNCCD as well.

Regular review of the experience of ongoing projects and programmes in the interface between desertification and the GEF focal areas, and consultations with the concerned countries and institutions, will help GEF progressively sharpen the focus of its desertification-related interventions.

95. The action plan for synergies is compatible with GEF practice and intentions to support, on a pilot basis, national and regional programmes aimed at ecological regeneration with significant potential for increasing the long-term contribution of drylands to carbon storage, to preventing loss of soil and to controling sediment pollution in international waters (see below). GEF attributes great importance to the critical role local communities have to play in developing and implementing programmes. GEF recognizes the need for advancing awareness in the concerned countries "of the linkages between land degradation and the global environment" since this will promote informed participation of communities in the design and implementation of their activities. GEF will also finance the incremental cost of capacity-building and of "enabling" activities in the developing affected countries to design and implement programmes achieving global environmental goals. The need for the local facilitators is implicit in GEF guidelines.

(b) "International waters" and UNCCD

96. Among the GEF focal areas, international waters (a compound term addressing several United Nations instruments) is another one (on top of climate change and desertification) that can be linked and synergize the combat against desertification. The role of water use in generating desertification and the significance of sustainable water resource management for the drylands in combating desertification, are clear. The GEF focal area is restricted to waters that come under the jurisdiction of more than one country. Yet, the relation of such waters to desertification can not be over-emphasized. First, because many of the water sources of affected countries, either rivers or aquifers, are shared by more than one country. Second, because desertified lands in one country can pollute and reduce the quality of water of another country. Desertification may therefore be affected by and may affect international waters, thus having cross-boundary indirect effects. In view of the growing sediment pollution from dryland soil erosion, and salt intrusion in rivers and aquifers, combating desertification is relevant to the international waters focal area. Effectively addressing this issue requires international cooperation, hence GEF may promote such cooperation.

97. Areas for support are (a) activities to combat desertification that result in the conservation of shared aquifers; (b) afforestation projects that can positively affect regional rainfall patterns and prevent variations in the flow, velocity and direction of shared rivers; (c) activities combating desertification through conservation and management of dryland wetlands that are either internationally shared or are of international importance. Note that these activities also affect positively biodiversity and carbon sequestration.

B. UNESCO and biosphere reserves

(a) The biosphere reserve concept

98. With mounting global pressure on land and water resources increasing the difficulty of allocating and protecting nature reserves, conservationists have been gradually changing their strategy for conservation of biodiversity. They have recognized that the conservation of biodiversity can not be dissociated from the needs of the local populations. They have also realized that, rather than losing the battle to create more "protected areas" that can not be protected because of constant conflict with either development or with the local populations, there is a need to reconcile conservation of biodiversity and development. This can be done by lowering the fences between protected areas and areas for other uses.

99. The first result of this approach has been the development of the concept of the biosphere reserve and its implementation by the Man and the Biosphere (MAB) programme of UNESCO. A biosphere reserve is not a reserve in the traditional sense, but a scheme of regional planning and management of a selected, relatively large, region or watershed. The basic feature is zoning, in which an area is allocated for strict conservation ("core"), another area is allocated for activities and practices for reaping direct benefits for the local population from the restricted area and its biodiversity ("buffer"), mainly in ecotourism and in recreation activities. The third zone is the largest in area ("transition", or "participation"), and is allocated to sustainable development. The communities living in the transition area (transition between the "reserve" and the "non-reserve") benefit from the ecosystem services provided by the core, but their land uses are constrained such that they do not endanger the core's biodiversity, but complement it. For example - by providing for species whose habitat-size requirements are not met by the relatively small core.

100. The critical component of the biosphere reserve concept is that the boundaries of the three zones and the management of each are determined in a participatory, bottom-up manner, sometimes promoted by partnership in planning and management. This approach provides sustainability both to development and to conservation of biodiversity within the reserve. This is also the approach preached by the UNCCD for combating desertification. Hence establishing biosphere reserves in the drylands as a means of synergizing the combat against desertification with conservation and sustainable use of biodiversity should be an option to be considered by the Parties to the UNCCD.

(b) Dryland biosphere reserves

101. Many biosphere reserves have been promoted by UNESCO, though not all are functional. Too few of them are in drylands. It is timely to learn from the rich experience of existing biosphere reserves and design a template for a dryland biosphere reserve. Since the concept of the biosphere reserve was devised, further development has taken place. For example, IUCN categorized six types of protected

area, of which four allow and promote sustainable use of biodiversity. A recent one, "reconciliation ecology", detaches conservation from protected areas, and explores modes of integrating conservation of biodiversity into all types of land use - rangelands, croplands, rural and even urban land uses and development. This venture may replace current conservation practices directed at protected areas, too many of which are ineffective, or their biodiversity is not used sustainably. Designing and managing biosphere reserves in the drylands can benefit from "reconciliatory conservation", by implementing newly proposed methods for integrating sustainable development of drylands with conservation of biodiversity. Furthermore, dryland soil, carbon pool, biodiversity, wetland and forest can be conserved within a dryland biosphere reserve benefiting from the "reconciliation" approach, better than biosphere reserves planned in the past.

(c) Biosphere reserves and GEF

102. The reconciliation and the biosphere reserve approach may appeal to GEF, given its recognition that *"Limiting access to protected areas increases pressures on other land. Conserving biodiversity is difficult when local needs are not met. With the help of planning … and involvement of local communities, land use practices and land management systems can be improved to increase vegetative cover, conserve biodiversity and raise land productivity"* (A Framework of GEF Activities Concerning Land Degradation, 1996). GEF is to give attention to a list of issues, all of which fit well with the UNESCO biosphere reserve concept and design, applied to drylands. Thus, UNESCO and GEF combined may set in the drylands "pilot" biosphere reserves, fully compatible with the proposed action plan for synergies, in which the biosphere reserves scheme will respond to the following issues raised by GEF:

(i) Land use planning and management, on a catchment and regional basis using natural boundaries, to facilitate the integration of conservation and production-oriented management of biodiversity. This would be based on ecological considerations, in areas susceptible to desertification;

(ii) Development and application of integrated land management and resource monitoring, involving relevant institutions and local communities; improvement of management practices, institutional arrangements, policies and incentives in agriculture, pastoralism, forestry, urban development and water use which impact desertification and through it the global environment;

(iii) In-situ conservation of significant components of biodiversity, particularly the native one, in drylands; rehabilitation of degraded land and water resources with a view to conserving ecosystem, species and genetic diversity, and with the participation of local populations.

103. To conclude, the dryland biosphere reserve may be an effective tool in working toward GEF objectives and promoting the action plan for synergies.

C. Ramsar sites and synergies

104. The Ramsar Convention has compiled a list of wetlands of international importance, the so-called Ramsar sites. There are 1,000 such sites spread across the Ramsar Convention's 116 country Parties, some of which are in drylands. The majority of the sites are demonstration sites for the "wise use" concept. Parties are expected to designate additional sites for the list and to "*formulate and implement their planning so as to promote the conservation of the wetlands included in the list, and ... the wise use of wetlands in their territory*" (article 3.1 of the Convention). These concepts and strategies may fit well into the action plan for synergies, for example by introducing elements of a dryland biosphere reserve, which may also include a dryland managed as a Ramsar site, as well as a elements for increasing carbon sequestration. Such integration may be attractive for support of GEF and other instruments, and may serve as the action plan for synergies' first-phase demonstration sites.

D. Rio convention secretariats

(a) UNCCD and CBD

105. At the request of the COP, the UNCCD secretariat in 1998 signed agreements on cooperation with the secretariats of two other conventions. The action plan for synergies corroborates article 4 of the memorandum of cooperation between the secretariats of the CBD and the UNCCD: "*The secretariats will consult with their Parties with a view to encouraging integration and consistency between national policies, strategies, plans and programmes under the two conventions as well as with other relevant conventions, in particular FCCC and Ramsar; the secretariats will ... develop a harmonized approach to assist Parties in their programmes for scientific research, education, training and public awareness with a view to approach them with long-term capacity-building objectives*".

106. This is also reflected in the attention paid by the Subsidiary Body on Scientific, Technical and Technological Advice of the CBD in its fourth meeting in June 1999, in discussing the note by the Executive Secretary on "Assessment of the status and trends and options for conservation and sustainable use of terrestrial biological diversity: dryland, Mediterranean, arid, semi-arid, grassland and savannah ecosystems" (UNEP/CBD/SBSTTA/4/7). In this document, it is recommended that the special problems of maintaining agricultural biological diversity and the special circumstances of forests in dryland ecosystems will become focal issues in the CBD work programmes on agricultural biological diversity and forest biological diversity, respectively.

107. Another cross-cutting concept developed by the CDB which neatly relates to the proposed action plan for synergies is that of the "ecosystem approach", which recognizes "*The greatest threat to biological diversity ... is the replacement by alternate systems of land use*" and proposes a series of incentives to those "*who control the resource*" (UNCBD, 1998). The ecosystem approach should be explored as a tool for synergizing the UNCCD.

(b) UNCCD and the Ramsar Convention

108. The action plan for synergies is also consistent with article IV of the memorandum of cooperation between the Bureau of the Convention on Wetlands and the secretariat of the UNCCD, signed in December 1998: "*The secretariats will consult their contracting Parties with a view to encouraging the identification and development of pilot projects targeting both the restoration of wetlands and surrounding degraded land*". More specifically, article II of the memorandum of cooperation recommends the secretariats to use "*a common list of ...wetlands ... and other significant sites in arid, semi-arid and sub-humid areas ... to be used for the identification of joint activities*". Furthermore, in the preamble to the memorandum of cooperation, the Parties consider "*that, in arid, semi-arid and dry sub-humid areas, combating desertification includes activities which are part of the integrated development of land*"; and they note "*that within drier parts of the world both conventions aim to conserve precious water resources;*". A progress report on the implementation of this memorandum of cooperation has been prepared by the Ramsar Convention secretariat, for consideration by the UNCCD COP 3. This includes guidelines for integrated implementation of the Ramsar and other conventions, at all levels. The report emphasizes that "*There is no doubt that protecting natural wetlands is one of the best options to mitigate drought impacts and combat desertification*" and proposes to jointly rehabilitate degraded dryland wetlands.

(c) UNCCD, CBD and Ramsar

109. The Ramsar Convention and CBD secretariats have a memorandum of understanding by which the Ramsar Convention is to act as CBD implementing mechanism for the activities relating to wetlands' biodiversity, through a joint work plan. A link between this memorandum of understanding and the UNCCD may be found in the suggestion of the above-mentioned SBSTTA document, that because inland water ecosystems in drylands are generally under far greater human pressure than these ecosystems elsewhere, any approach and analysis of biodiversity in these systems will have to take into consideration water use and water balance within the catchment as a whole. It therefore recommends that the inland water ecosystems in drylands be addressed in the CBD work programme on inland water ecosystems. Thus, the joint work plan may easily be extended into an agreement for joint action by the UNCCD, CBD and Ramsar secretariats in all issues relating to dryland wetlands, with respect to wetland biodiversity as well as other wetland-related attributes. Such an agreement is timely since the Ramsar Convention has already developed tools for promoting the involvement of local populations in wetland management, which may

fit neatly into the bottom-up awareness-raising strategy of the action plan for synergies.

(d) UNCCD and UNFCCC

110. The recently emerging significance of the interactions between climate change and desertification point at the strong potential for synergies in joint implementation of the UNFCCC and the UNCCD in the drylands. The "clean development mechanism" (article 12 of the Kyoto Protocol), for example, may serve as a focus for joint consideration. Under this mechanism, developing countries ("non-Annex I countries") will benefit from project activities resulting in certified emission reductions. Yet, it is still a long way to go for an agreement of the Parties to the UNFCCC that "land use" carbon sequestration could meet a part of the emission reduction obligations of Annex I countries, which is a key element in establishing an incentive mechanism, so critical for UNCCD synergies. Much still depends on the ratification of the Kyoto Protocol and on whether or not sequestration will be driven by incentives. But an agreement on cooperation between the secretariats of the UNFCCC and the UNCCD may already facilitate the establishment of windows for synergies in field implementation. Such an agreement may include joint activities at the national level, especially in capacity-building, training and outreach, as well as activities at the international level, especially in research, information and data management, related to dryland regions.

Training and research institutions

111. Pursuant to article 25 of the UNCCD on networking of institutions, agencies and bodies, a network to support the implementation of the UNCCD will be established. A survey is currently being carried out by UNEP, of institutions involved in work relevant to combating desertification, and their evaluation. On the basis of this survey, the Committee on Science and Technology of the UNCCD will make recommendations to the Conference of the Parties, that will enable the COP to identify the institutions best suited to facilitating and strengthening networking. This networking will be instrumental in allocating synergy-related tasks to different institutions. These may include, among other things, institutions for training the facilitators, for monitoring the projects' implementation and their effects, and for evaluating their success, with a view to improving their performance. Research institutions may be commissioned too, to further elucidate the linkages and synergies between the subject-matters of the agreements in order to update the ongoing programmes when knowledge improves. This effort may generate the necessary instruments and mechanisms for training the facilitators working under the action plan for synergies.

V. RECOMMENDATIONS

112. When constructing a national action plan or other programme or project to combat desertification, each of the prescribed activities and implementation options should also be screened for its win-win potential, i.e. whether that activity, besides combating desertification, is also instrumental in one or several of the following - mitigation of climate change, conservation and promotion of sustainable use of biodiversity, wetlands and forests - thus complying with the recommendations and commitments of one or several of the following agreements - UNFCCC, CBD, Ramsar convention and the Forest Principles.

113. Additional activities that comply with one or several of the above-mentioned instruments, should be explored for their potential to link up with and strengthen the combat against desertification when integrated with other activities and measures prescribed by the plan, programme or project.

114. Pursuant to the results of the above screening and exploration, respectively, the plan or programme or project may include modalities, means and strategies for raising awareness at all levels - the local population, community leaders, government officials, the private sector, governmental, non-governmental and international organizations and institutions - to the win-win components. If successful, this awareness-raising will be instrumental in generating the major, additional or incremental support to the plan, programme or project. This support will synergize the combat against desertification and the field implementation of the UNCCD.

115. Pilot projects incorporating the approach specified in paragraphs 112-114 above, if successful, may then be used to demonstrate and thus catalyse this synergistic approach to UNCCD implementation, and promote its application on an increasingly large scale, in order to achieve an impact at the whole-country level.

116. The implementation of the above recommendation may depend greatly on the work of local facilitators, with expertise in the subject-matters of all the relevant conventions and agreements, and experienced in implementing these instruments. It may be necessary to commission existing institution to recruit, train, assign and support these facilitators.

Annex

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